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Investigation of band alignments of HfO_2 and Al_2O_3 thin films using XPS

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The thermal stabilities and band alignments of ALD grown HfO_2 and Al_2O_3 thin films have been studied using X-ray photoelectron spectroscopy (XPS). From the threshold of energy loss spectra of *O1s*, band gaps for HfO_2 and Al_2O_3 were estimated, respectively. In addition, valence band offsets of high-K materials on Si were determined from valence band spectra of XPS. By combining these values, we demonstrated the energy band profile for these oxide films. The changes of conduction band offsets, valence band offsets and band gap as a function of annealing temperature will be discussed. It shows that HfO_2 film has asymmetric barrier heights for electron and holes and there is a scaling trend for E_g after annealing treatment, while Al_2O_3 film shows symmetric band offsets.